

IMAGE PICKUP APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to an image pickup apparatus for adjusting tone of image data picked up by an image pickup element having a plurality of color filters.

Related Background Art

10 To output image data picked up by an image pickup element having a plurality of color filters, the color temperature of a light source in the picked-up image, and the picked-up image data undergoes white balance adjustment, thereby performing faithful color
15 reproduction of the picked-up image.

 The white balance adjustment methods include a method of determining the color temperature of a light source using a calorimetric element and a method of searching for an achromatic portion in the picked-up
20 image and determining the color temperature of the achromatic portion. These methods, however, cannot accurately adjust the white balance due to detection errors of colors of the light sources.

 As one of the most accurate white balance
25 adjustment methods, a white balance adjustment method is available in which an achromatic object is picked up (this operation is called white sheet image pickup), a

control value is obtained so as to equalize the magnitudes of color components of the picked-up image, and white balance adjustment is performed for the subsequent image pickup using the control value. This white balance adjustment method will be referred to as a manual white balance (MWB) hereinafter.

A conventional MWB control method using white sheet image pickup is shown in Fig. 11. Fig. 11 shows the conventional white balance adjustment method of partially extracting data (to be referred to white sheet data hereinafter) from an achromatic image (to be referred to as a white sheet image hereinafter) picked up by an image pickup element having a plurality of color filters, recording the extracted white sheet data on a recording medium, reading the white sheet data from the medium in the subsequent image pickup to calculate a white balance control value, and adjusting the white balance using the calculated control value.

The plurality of color filters of the image pickup element are arrays each made up of primary color filters of R, G1, G2, and B, as shown in Fig. 5. Image pickup data input from an image pickup data input terminal 1001 is processed by a main image processing unit 1002, encoding processing unit 1003, and image filing unit 1004. The processed data is recorded on a recording medium as image data by a medium-recording unit 1005.

Independently of this normal image recording process, part of the image pickup data is extracted by an image data extraction unit as MWB white sheet data. The extracted MWB white sheet data is recorded in the MWB data area of the recording medium.

When the white balance mode is set in the MWB in the subsequent image pickup, a medium-reproduction unit 1007 in the image pickup apparatus reproduces the white data recorded on the medium. A white balance control value read-out unit 1008 reads out the white data. A white balance control value operating unit 1009 calculates the R, G1, G2, and B white balance control values so as to equalize the magnitudes of the average values of the R, G1, G2, and B color signals of the white data.

The white balance control values obtained by the white balance control value operating unit 1009 are set for white balance adjustment of the image pickup apparatus by a white balance control value setting unit 1010. Using the set control values, a white balance adjustment unit 1014 adjusts the white balance of the image pickup data input from an image pickup data input terminal 1013 in the subsequent image pickup. A color processing unit 1015 performs final color adjustment such as color correction processing using a color matrix. An encoding processing unit 1016 encodes the color-adjusted data into a recording format. The data